

## What Is Claimed Is:

1. A method for producing in a plant resistance to a single stranded DNA (ssDNA) virus comprising introducing a ssDNA-binding protein of the Inoviridae virus family into said  
5 plant.

2. The method of claim 1 wherein said Inoviridae family virus is selected from the group consisting of the Inovirus and Plectrovirus genuses.

3. The method of claim 2 wherein said Inovirus genus  
10 virus is selected from the group consisting of Coliphage, enterobacteria phage, Pseudomonas phage, Vibrio phage and Xanthomonas phage species.

4. The method of claim 3 wherein said Coliphage species of virus is selected from the group consisting of AE2, dA, Ec9,  
15 f1, fd, HR, M13, ZG/2 and ZJ/2 coliphages.

5. The method of claim 1 wherein said ssDNA-binding protein is a coat protein or a gene 5 protein.

6. The method of claim 1 wherein said ssDNA-binding protein is the Coliphage M13 gene 5 protein.

20 7. The method of claim 6 wherein said Coliphage M13 gene 5 protein has the amino acid residue sequence of SEQ ID NO 1.

8. The method of claim 1 wherein said introducing comprises preparing a transgenic plant containing a gene which expresses said ssDNA-binding protein.

25 9. The method of claim 8 wherein said gene comprises a nucleotide sequence shown in SEQ ID NOs 2 or 3.

10. The method of claim 1 wherein said introducing comprises contacting said plant with a composition containing an expression vector capable of expressing said ssDNA-binding  
30 protein.

11. The method of claim 10 wherein said expression vector comprises a nucleotide sequence shown in SEQ ID NOs 2 or 3.

12. The method of claim 10 wherein said contacting comprises biolistic gene transfer or direct DNA uptake into protoplast.

13. The method of claim 10 wherein said contacting  
5 comprises infection of said plant with a carrier vector

14. The method of claim 13 wherein said carrier vector is an Agrobacterium vector.

15. The method of claim 10 wherein said expression vector is present in a virus particle capable of infecting said plant  
10 and expressing said ssDNA-binding coat protein.

16. The method of claim 1 wherein said plant is selected from the group consisting of Abutilon, Acalypha, apple, Ageratum, Althea rosea, Asystasia, Bajra, banana, barley, beans, beet, Blackgram, Bromus, Cassava, chickpea, Chilllies, Chloris,  
15 clover, coconut, coffee, cotton, cowpea, Croton, cucumber, Digitaria, Dolichos, eggplant, Eupatorium, Euphorbia, fababean, honeysuckle, horsegram, Jatropha, Leonurus, limabean, Lupin, Macroptilium, Macrotyloma, maize, melon, millet, mungbean, oat, okra, Panicum, papaya, Paspalum, peanut, pea, pepper, pigeon  
20 pea, pineapple, Phaseolus, potato, Pseuderanthemum, pumpkin, Rhynchosia, rice, Serrano, Sida, sorghum, soybean, squash, sugarcane, sugarbeet, sunflower, sweet potato, tea, tomato, tobacco, watermelon, wheat and Wissadula.

17. The method of claim 1 wherein said ssDNA virus is a  
25 Geminivirus family virus.

18. The method of claim 17 wherein said Geminivirus is selected from the group consisting of Mastrevirus, Curtovirus and Begomovirus genera.

19. The method of claim 1 wherein said ssDNA virus is a  
30 Mastrevirus genus species selected from the group consisting of Bajra streak virus, Bean yellow dwarf virus, Bromus striate mosaic virus, Chickpea chlorotic dwarf virus, Chloris striate

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mosaic virus, Digitaria streak virus, Digitaria striate mosaic virus, Maize streak virus//Ethiopia, Maize streak virus//Ghana1, Maize streak virus//Ghana2, Maize streak virus//Kenya, Maize streak virus//Komatipoort, Maize streak virus//Malawi, Maize streak virus//Mauritius, Maize streak virus//Mozambique, Maize streak virus//Nigeria1, Maize streak virus//Nigeria2, Maize streak virus//Nigeria3, Maize streak virus//Port Elizabeth, Maize streak virus//Reunion1, Maize streak virus//Reunion2, Maize streak virus//Setaria, Maize streak virus//South Africa, Maize streak virus//Tas, Maize streak virus//Uganda, Maize streak virus//Vaalhart maize, Maize streak virus//Vaalhart wheat, Maize streak virus//Wheat-eleusian, Maize streak virus//Zaire, Maize streak virus//Zimbabwe1, Maize streak virus//Zimbabwe2, Miscanthus streak virus, Panicum streak virus/Karino, Panicum streak virus/Kenya, Paspalum striate mosaic virus, Sugarcane streak virus//Egypt, Sugarcane streak virus/Natal, Sugarcane streak virus/Mauritius, Tobacco yellow dwarf virus, Wheat dwarf virus/Czech Republic [Wheat dwarf virus-CJI, WDV-CJI], Wheat dwarf virus/France and Wheat dwarf virus/Sweden.

20. The method of claim 1 wherein said ssDNA virus is a Curtovirus genus species selected from the group consisting of Beet curly top virus-California, Beet curly top virus-California//Logan, Beet curly top virus-CFH, Beet curly top virus//Iran, Beet curly top virus-Worland, Horseradish curly top virus, Tomato leafroll virus and Tomato pseudo-curly top virus.

21. The method of claim 1 wherein said ssDNA virus is a Begomovirus genus species selected from the group consisting of Abutilon mosaic virus, Acalypha yellow mosaic virus, African cassava mosaic virus//Ghana, African cassava mosaic virus/Kenya, African cassava mosaic virus/Nigeria, African cassava mosaic

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virus/Uganda, Ageratum yellow vein virus, Althea rosea enation virus, Asystasia golden mosaic virus, Bean calico mosaic virus, Bean dwarf mosaic virus, Bean golden mosaic virus-Brazil, Bean golden mosaic virus-Puerto Rico, Bean golden mosaic virus-Puerto Rico/Dominican Rep. [Bean golden mosaic virus-Dominican Rep., BGMV-DR], Bean golden mosaic virus-Puerto Rico/Guatemala [Bean golden mosaic virus-Guatemala, BGMV-GA], Bhendi yellow vein mosaic virus, Chino del tomate virus [Tomato leaf crumple virus, TLCrV], Cotton leaf crumple virus, Cotton leaf curl virus-India, Cotton leaf curl virus-Pakistan1/Faisalabad1 [Cotton leaf curl virus-Pakistan2], Cotton leaf curl virus-Pakistan1/Faisalabad2 [Cotton leaf curl virus-Pakistan3], Cotton leaf curl virus-Pakistan1/Multan [Cotton leaf curl virus-Pakistan1], Cotton leaf curl virus-Pakistan2/Faisalabad [Pakistani cotton leaf curl virus], Cowpea golden mosaic virus, Croton yellow vein mosaic virus//Lucknow, Dolichos yellow mosaic virus, East african cassava mosaic virus/Kenya, East african cassava mosaic virus/Malawi, East african cassava mosaic virus/Tanzania, East african cassava mosaic virus/Uganda//1 [African cassava mosaic virus-Uganda variant], East african cassava mosaic virus/Uganda//2, Eclipta yellow vein virus, Eggplant yellow mosaic virus, Eupatorium yellow vein virus, Euphorbia mosaic virus, Honeysuckle yellow vein mosaic virus, Horsegram yellow mosaic virus, Indian cassava mosaic virus, Jatropha mosaic virus, Leonurus mosaic virus, Limabean golden mosaic virus, Lupin leaf curl virus, Macroptilium golden mosaic virus-Jamaica//2, Macroptilium golden mosaic virus-Jamaica//3, Macrotyloma mosaic virus, Malvaceous chlorosis virus, Melon leaf curl virus, Mungbean yellow mosaic virus, Okra leaf curl virus//Ivory Coast, Okra leaf curl virus//India, Papaya leaf curl virus, Pepper huasteco virus,

Pepper golden mosaic virus, [Texas pepper virus], Pepper mild tigrÄ virus, Potato yellow mosaic virus//Guadeloupe, Potato yellow mosaic virus/Trinidad and Tobago, Potato yellow mosaic virus/Venezuela, Pseuderanthemum yellow vein virus,

5 Rhynchosia mosaic virus, Serrano golden mosaic virus, Sida golden mosaic virus/Costa Rica, Sida golden mosaic virus/Honduras, Sida golden mosaic virus/Honduras//Yellow vein, Sida yellow vein virus, Solanum apical leaf curl virus, Soybean crinkle leaf virus, Squash leaf curl virus, Squash leaf curl

10 virus/Extended host, Squash leaf curl virus/Restricted host, Squash leaf curl virus/Los Mochis, Squash leaf curl virus-China, Tomato golden mosaic virus/Common strain, Tomato golden mosaic virus/Yellow vein strain, Tobacco leaf curl virus//India, Tobacco leaf curl virus-China, Tomato

15 leaf curl virus//Solanum species D1, Tomato leaf curl virus//Solanum species D2, Tomato leaf curl virus-Australia, Tomato leaf curl virus-Bangalore1 [Indian tomato leaf curl virus-BangaloreI], Tomato leaf curl virus-Bangalore2, [Indian tomato leaf curl virus, ItoLCV], Tomato leaf curl

20 virus-Bangalore3 [Indian tomato leaf curl virus- BangaloreII], Tomato leaf curl virus-New Delhi/Severe [Tomato leaf curl virus-India2, ToLCV-IN1], Tomato leaf curl virus-New Delhi/Mild [Tomato leaf curl virus-India2, ToLCV-IN2], Tomato leaf curl virus-New Delhi/Lucknow [Indian tomato leaf curl virus], Tomato

25 leaf curl virus//Senegal, Tomato leaf curl virus-Sinaloa [Sinaloa tomato leaf curl virus, STL CV], Tomato leaf curl virus-Taiwan, Tomato leaf curl virus-Tanzania, Tomato mottle virus, Tomato mottle virus-Taino [Taino tomato mottle virus, TT MoV], Tomato severe leaf curl virus//Guatemala, Tomato severe

30 leaf curl virus//Honduras, Tomato severe leaf curl virus//Nicaragua, Tomato yellow dwarf virus, Tomato yellow leaf curl virus-China, Tomato yellow leaf curl virus-Israel, Tomato

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yellow leaf curl virus-Israel/Mild, Tomato yellow leaf curl virus-Israel/Egypt, [Tomato yellow leaf curl virus-Egypt, TYLCV-EG], Tomato yellow leaf curl virus-Israel//Cuba, Tomato yellow leaf curl virus-Israel//Jamaica, Tomato yellow leaf curl virus-Israel//Saudi Arabia<sup>1</sup>, [Tomato yellow leaf curl virus-Northern Saudi Arabia, TYLCV-NSA], Tomato yellow leaf curl virus-Nigeria, Tomato yellow leaf curl virus-Sardinia, Tomato yellow leaf curl virus-Sardinia/Sicily [Tomato yellow leaf curl virus-Sicily, TYLCV-SY], Tomato yellow leaf curl virus-Sardinia/Spain//1 [Tomato yellow leaf curl virus-Spain, TYLCV-Sp], Tomato yellow leaf curl virus-Sardinia/Spain//2 [Tomato yellow leaf curl virus-Almeria, TYLCV-Almeria], Tomato yellow leaf curl virus-Sardinia/Spain//3 [Tomato yellow leaf curl virus-European strain], Tomato yellow leaf curl virus-Saudi Arabia [Tomato yellow leaf curl virus-Southern Saudi Arabia, TYLCV-SSA], Tomato yellow leaf curl virus-Tanzania, Tomato yellow leaf curl virus-Thailand//1, Tomato yellow leaf curl virus-Thailand//2, Tomato yellow leaf curl virus//Yemen, Tomato yellow mosaic virus-Brazil//1, Tomato yellow mosaic virus-Brazil//2, Tomato yellow mottle virus, Tomato yellow vein streak virus-Brazil, Watermelon chlorotic stunt virus, Watermelon curly mottle virus and Wassadula golden mosaic virus-Jamaica//1.

22. The method of claim 1 wherein said ssDNA virus is Banana bunchy top virus, Coconut foliar decay virus, Fababean necrotic yellows virus, Milk vetch dwarf virus or Subterranean clover stunt virus.

23. The method of claim 1 wherein said ssDNA virus is geminivirus and said ssDNA-binding protein is Coliphage M13 gene 5 protein.

24. A method for producing geminivirus resistance in a plant comprising introducing into said plant a gene capable of

expressing Coliphage M13 gene 5 protein in said plant.

25. A DNA expression vector comprising a nucleotide sequence that encodes a ssDNA-binding protein of the Inoviridae virus family, wherein said vector is capable of expressing said  
5 protein in plants.

26. The DNA expression vector of claim 25 wherein said Inoviridae family virus is selected from the group consisting of the Inovirus and Plectrovirus genuses.

27. The DNA expression vector of claim 26 wherein said  
10 Inovirus genus virus is selected from the group consisting of Coliphage, enterobacteria phage, Pseudomonas phage, Vibrio phage and Xanthomonas phage species.

28. The DNA expression vector of claim 27 wherein said Coliphage species of virus is selected from the group consisting  
15 of AE2, dA, Ec9, f1, fd, HR, M13, ZG/2 and ZJ/2 coliphages.

29. The DNA expression vector of claim 25 wherein said ssDNA-binding protein is a coat protein or a gene 5 protein.

30. The DNA expression vector of claim 25 wherein said ssDNA-binding protein is the Coliphage M13 gene 5 protein.

20 31. The DNA expression vector of claim 30 wherein said Coliphage M13 gene 5 protein has the amino acid residue sequence of SEQ ID NO 1.

32. The DNA expression vector of claim 25 wherein said nucleotide sequence comprises a nucleotide sequence shown in SEQ  
25 ID NOs 2 or 3.

33. The DNA expression vector of claim 25 wherein said vector is a carrier vector

34. The DNA expression vector of claim 33 wherein said carrier vector is an Agrobacterium vector.

30 35. The DNA expression vector of claim 25 wherein said plant is selected from the group consisting of Abutilon, Acalypha, apple, Ageratum, Althea rosea, Asystasia, Bajra,

banana, barley, beans, beet, Blackgram, Bromus, Cassava, chickpea, Chilllies, Chloris, clover, coconut, coffee, cotton, cowpea, Croton, cucumber, Digitaria, Dolichos, eggplant, Eupatorium, Euphorbia, fababean, honeysuckle, horsegram, 5 Jatropha, Leonurus, limabean, Lupin, Macroptilium, Macrotyloma, maize, melon, millet, mungbean, oat, okra, Panicum, papaya, Paspalum, peanut, pea, pepper, pigeon pea, pineapple, Phaseolus, potato, Pseuderanthemum, pumpkin, Rhynchosia, rice, Serrano, Sida, sorghum, soybean, squash, sugarcane, sugarbeet, sunflower, 10 sweet potato, tea, tomato, tobacco, watermelon, wheat and Wissadula.

36. The DNA expression vector of claim 25 wherein said ssDNA virus is a Geminivirus family virus.

37. The DNA expression vector of claim 36 wherein said 15 Geminivirus is selected from the group consisting of Mastrevirus, Curtovirus and Begomovirus genera.

38. The DNA expression vector of claim 25 wherein said ssDNA virus is geminivirus and said ssDNA-binding protein is Coliphage M13 gene 5 protein.

20 39. A composition for producing resistance to a ssDNA virus that infects plants comprising an effective amount of a DNA expression vector comprising a nucleotide sequence that encodes a ssDNA-binding protein of the Inoviridae virus family, wherein said vector is capable of expressing said protein in 25 said plant.

40. The composition of claim 39 wherein said DNA expression vector is the vector of claim 25.

41. The composition of claim 39 wherein said ssDNA-binding protein is the Coliphage M13 gene 5 protein.

30 42. The composition of claim 39 wherein said Coliphage M13 gene 5 protein has the amino acid residue sequence of SEQ ID NO 1.



44. The composition of claim 39 wherein said DNA expression vector is a carrier vector.

46. A transgenic plant containing a DNA expression vector comprising a nucleotide sequence that encodes a ssDNA-binding protein of the Inoviridae virus family, wherein said vector is capable of expressing said protein in said plant.

48. The transgenic plant of claim 46 wherein said ssDNA-binding protein is the Coliphage M13 gene 5 protein.

50. The transgenic plant of claim 46 wherein said nucleotide sequence comprises a nucleotide sequence shown in SEQ ID NOs 2 or 3.